

BOARD OF COUNTY COMMISSIONERS

AGENDA ITEM SUMMARY

Meeting Date: 18 December 2002

Division: Growth Management

Bulk Item: Yes No X

Department: Marine Resources

AGENDA ITEM WORDING:

Approval to submit the EPA grant application in order to be eligible to receive decentralized wastewater utility funding.

ITEM BACKGROUND:

In the summer of 2000, Congress provided \$3.8 M in funds to Monroe County to develop and implement a centralized management approach for decentralized wastewater systems. The Grant requires four basic components: 1) Up to 75 % of the grant may be used to cover the cost of design, construction, monitoring, O & M, and administering decentralized wastewater systems. 2) The funds must be used in areas where a decentralized approach to wastewater improvements is a viable long-term solution (at least 15 year life). 3) Establishment of a centralized authority to manage decentralized wastewater systems is an essential component of the grant. 4) Any project must be consistent with the County's Wastewater Master Plan.

The Board approved a two pronged approach for moving forward; 1) having CH2MHill develop and submit the EPA grant application and 2) Having CH2MHill develop a project feasibility analysis. The attached document provides the Board with a copy of the EPA grant application submittal. Separately, CH2MHill will provide the Board and the FCAA Board with the feasibility analysis, which will allow both Boards to determine whether or not to move forward with accepting the EPA grant.

PREVIOUS RELEVANT BOCC ACTION:

September 2002 – Approval to develop and submit the EPA grant application

CONTRACT/AGREEMENT CHANGES:

NA

STAFF RECOMMENDATIONS:

Approval

TOTAL COST: \$5.07 M

BUDGETED: Yes No NA

COST TO COUNTY: \$1.27 M (User Fees / Fund 304 or other for ineligible costs)

REVENUE PRODUCING: Yes No NA AMOUNT Per Month Year

APPROVED BY: County Atty NA OMB/Purchasing NA Risk Management NA

DIVISION DIRECTOR APPROVAL: Timothy McGarity
Timothy McGarity, Director of Growth Management

DOCUMENTATION: Included X To Follow Not Required

DISPOSITION: AGENDA ITEM NO.: T9



CH2MHILL

CH2M HILL

6410 5th Street

Suite 2A

Key West, FL 33040-5835

Tel 305.294.1645

Fax 305.294.4913

December 2, 2002

Mr. George Garrett, Director
Department of Marine Resource
2798 Overseas Highway, Suite 420
Marathon, Florida 33050

Subject: EPA Onsite Decentralized Wastewater Treatment System
Demonstration Project Grant Application

Dear George:

Enclosed for your review and comment are the following:

- Draft Grant Application forms
- Draft Project Work Plan

For the grant application forms, I still need to add the "Catalog of Federal Domestic Assistance Number". I contacted Bob Freeman early last week for this number but have not yet heard back from him. Also, I need from the County the permanent population and the minority population for unincorporated Monroe County so I can prorate the minority population for the demonstration area.

For the work plan, as soon as I receive the GIS data, I will have Figures 4-1 through 4-6 developed and include them. The budget in this draft of the work plan is slightly revised from the previous one I gave you, in order to have the different budget components total the \$5.07M that is available for this demonstration project. I still need to include the bar graph for the schedule in Figure 6-1. The total length of the demonstration project is four years.

Let me know how we should proceed from here.

Sincerely,

CH2M HILL

Kenneth F. Williams, P.E.

c: Tim McGarry / Monroe County (with enclosures)

BUDGET INFORMATION - Non-Construction Programs

OMB Approval No. 0348-0044

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Onsite Decentralized		\$	\$	\$ 3,800,000.00	\$ 1,270,000.00	\$ 5,070,000.00
2. Wastewater Demons						0.00
3.						0.00
4.						0.00
5. Totals		\$ 0.00	\$ 0.00	\$ 3,800,000.00	\$ 1,270,000.00	\$ 5,070,000.00

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total (5)
	(1) Onsite Decentralized	(2)	(3)	(4)	
a. Personnel	\$ 1,167,000.00	\$	\$	\$	\$ 1,167,000.00
b. Fringe Benefits	443,000.00				443,000.00
c. Travel	40,000.00				40,000.00
d. Equipment	210,000.00				210,000.00
e. Supplies	25,000.00				25,000.00
f. Contractual	1,300,000.00				1,300,000.00
g. Construction	1,800,000.00				1,800,000.00
h. Other	85,000.00				85,000.00
i. Total Direct Charges (sum of 6a-6h)	5,070,000.00	0.00	0.00	0.00	5,070,000.00
j. Indirect Charges					0.00
k. TOTALS (sum of 6i and 6j)	\$ 5,070,000.00	\$ 0.00	\$ 0.00	\$ 0.00	\$ 5,070,000.00
7. Program Income	\$	\$	\$	\$	0.00

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Standard Form 424A (Rev. 7-97)
Prescribed by OMB Circular A-102

SECTION C - NON FEDERAL RESOURCES					
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS	
8. Onsite Decentralized Wastewater Demonstration	\$ 1,270,000.00	\$ 0.00	\$ 0.00	\$ 1,270,000.00	
9.				0.00	
10.				0.00	
11.				0.00	
12. TOTAL (sum of lines 8-11)	\$ 1,270,000.00	\$ 0.00	\$ 0.00	\$ 1,270,000.00	
SECTION D - FORECASTED CASH NEEDS					
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	\$ 3,800,000.00	\$ 342,000.00	\$ 2,411,000.00	\$ 518,000.00	\$ 529,000.00
14. Non-Federal	1,270,000.00	300,000.00	370,000.00	300,000.00	300,000.00
15. TOTAL (sum of lines 13 and 14)	\$ 5,070,000.00	\$ 642,000.00	\$ 2,781,000.00	\$ 818,000.00	\$ 829,000.00
SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT					
(a) Grant Program	FUTURE FUNDING PERIODS (Years)				
	(b) First	(c) Second	(d) Third	(e) Fourth	
16.	\$	\$	\$	\$	
17.					
18.					
19.					
20. TOTAL (sum of lines 16-19)	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00	
SECTION F - OTHER BUDGET INFORMATION					
21. Direct Charges:		22. Indirect Charges:			
23. Remarks:					

ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL		TITLE
		County Administrator
APPLICANT ORGANIZATION		DATE SUBMITTED
Monroe County		December 18, 2002

United States Environmental Protection Agency
Washington, DC 20460

**Certification Regarding
Debarment, Suspension, and Other Responsibility Matters**

The prospective participant certifies to the best of its knowledge and belief that it and the principals:

- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- (b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- (c) Are not presently indicted for otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1) (b) of this certification; and
- (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated or cause or default.

I understand that a false statement on this certification may be ground for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to \$10,000 or imprisonment for up to 5 years, or both.

James L. Roberts County Administrator
Typed Name & Title of Authorized Representative

Signature of Authorized Representative Date

☐

I am unable to certify to the above statements. My explanation is attached.

CERTIFICATION REGARDING LOBBYING

**CERTIFICATION FOR CONTRACTS, GRANTS,
LOANS, AND COOPERATIVE AGREEMENTS**

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including sub-contracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31 U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

James L. Roberts County Administrator

Typed Name & Title of Authorized Representative

Signature of Authorized Representative

Date



Washington, DC 20460
Preaward Compliance Review Report for
All Applicants Requesting Federal Financial Assistance

FORM Approved
OMB No. 2090-0014
Expires 4-30-99

Note: Read instructions before completing form.

I. A. Applicant (Name, City, State) Monroe County 1100 Simonton Street Key West, Florida 33040		B. Recipient (Name, City, State) Monroe County 1100 Simonton Street Key West, Florida 33040	C. EPA Project No.
II. Brief description of proposed project, program or activity. A project to demonstrate how decentralized onsite wastewater treatment systems can be managed as a utility to provide more efficient and more economical operations that will meet Monroe County treatment standards.			
III. Are any civil rights lawsuits or complaints pending against applicant and/or recipient? If yes, list those complaints and the disposition of each complaint.			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
IV. Have any civil rights compliance reviews of the applicant and/or recipient been conducted by any Federal agency during the two years prior to this application for activities which would receive EPA assistance? If yes, list those compliance reviews and status of each review.			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
V. Is any other Federal financial assistance being applied for or is any other Federal financial assistance being applied to any portion of this project, program or activity? If yes, list the other Federal Agency(s), describe the associated work and the dollar amount of assistance.			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
VI. If entire community under the applicant's jurisdiction is not served under the existing facilities/services, or will not be served under the proposed plan, give reasons why. See Attached			
VII. Population Characteristics			Number of People
1. A. Population of Entire Service Area			4,380
B. Minority Population of Entire Service Area			650
2. A. Population Currently Being Served			-0-
B. Minority Population Currently Being Served			-0-
3. A. Population to be Served by Project, Program or Activity			250
B. Minority Population to be Served by Project, Program or Activity			40
4. A. Population to Remain Without Service			4,130
B. Minority Population to Remain Without Service			610
VII. Will all new facilities or alterations to existing facilities financed by these funds be designed and constructed to be readily accessible to and usable by handicapped persons? If no, explain how a regulatory exception (40 CFR 7.70) applies. Facilities to be maintained by trained personnel who, because of confined space, cannot be handicapped.			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
IX. Give the schedule for future projects, programs or activities (or of future plans), by which services will be provided to all beneficiaries within applicant's jurisdiction. If there is no schedule, explain why. All beneficiaries will have service by July 1, 2010. Future projects will begin in 2006, so all beneficiaries will be served by July 1, 2010.			
X. I certify that the statements I have made on this form and all attachments thereto are true, accurate and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law.			
A. Signature of Authorized Official		B. Title of Authorized Official County Administrator	C. Date December 18, 2002
For the U.S. Environmental Protection Agency			
<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved		Authorized EPA Official	Date

EPA Form 4700-4 - Attachment

Monroe County
1100 Simonton Street
Key West, Florida 33040

- VI. The Monroe County Sanitary Wastewater Master Plan recommends central wastewater collection and treatment systems for the more densely developed areas under the applicant's jurisdiction and onsite wastewater treatment systems only for the more remote and less developed areas. The proposed plan will select only representative areas that will continue to be served by upgraded onsite wastewater treatment systems to demonstrate how a utility can manage these systems more efficiently. Other areas that will continue to be served by upgraded onsite wastewater treatment systems will be included under the utility after this demonstration program has been completed.

PROJECT WORK PLAN

FOR:

**National Onsite/Decentralized Wastewater Treatment
System Demonstration Project in the
Florida Keys, Monroe County, Florida**

To:

U.S. Environmental Protection Agency
Office of Grants and Debarment
401 M. Street, SW (3909R)
Room 51288
Washington, D.C. 20460

Submitted By:

Monroe County, Florida

December 2002

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FIGURES

- 2-1 Thirty percent, or 7,200 of the 23,000 onsite wastewater systems in the Keys are not permitted, and may include up to 2,800 illegal cesspools.
- 2-2 Many of the unknown systems in the Keys are cesspools, or seepage pits, and provide little, if any, wastewater treatment.
- 2-3 Conventional OWTS.
- 2-4 Small aerobic biological treatment units (ATUs) are common in the Keys, and function similarly to centralized secondary wastewater treatment facilities.
- 2-5 Onsite Wastewater Nutrient Reduction Systems (OWNRS) recommended for Monroe County removes nitrogen and phosphorus in a 3-step process.
- 2-6 Wastewater Management Alternatives Decision Model.
- 4-1
- 4-2
- 4-3
- 4-4
- 4-5
- 4-6
- 5-1 Technical and Institutional Factors in Onsite Wastewater Systems Management Planning
- 6-1 Florida Keys Decentralized Onsite Wastewater Treatment System Demonstration Project Schedule

TABLES

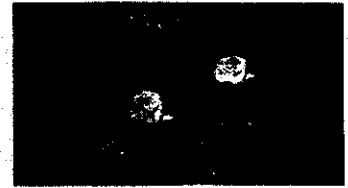
- 2-1 Florida Statutory Treatment Standards.
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- 6-1 Florida Keys Decentralized Onsite Wastewater Treatment System Demonstration Project Budget

GLOSSARY

GLOSSARY

ATU	Aerobic treatment unit
AWT	Advanced wastewater treatment
BAT	Best available treatment
BOCC	Board of County Commissioners
BOD	Biological oxygen demand
CBOD	Carboneous biological oxygen demand
DOH	Department of Health (Florida)
DWTS	Decentralized Wastewater Treatment Systems
EPA	U.S. Environmental Protection Agency
ETV	Environmental Technology Verification
FDEP	Florida Department of Environmental Protection
FKNMS	Florida Keys National Marine Sanctuary
MCSWMP	Monroe County Sanitary Wastewater Master Plan
NOAA	National Oceanographic and Atmospheric Administration
NSF	National Sanitation Foundation
OFW	Outstanding Florida Waters
OWNRS	Onsite wastewater nutrient reduction system
OWTS	Onsite wastewater treatment system
QA/QC	Quality assurance/quality control
RMC	Remote monitoring and control
SDI	Subsurface drip irrigation
SOP	Standard operating procedure
SWIS	Subsurface wastewater infiltration system
TN	Total nitrogen
TP	Total phosphorus
TSS	Total suspended solids
WWTP	Wastewater treatment plant

National Onsite/Decentralized Wastewater Treatment Demonstration Project in the Florida Keys, Monroe County



PROJECT WORK PLAN

1.0 INTRODUCTION

Monroe County is preparing an Application for Federal Assistance (SF-424) for a National Onsite/Decentralized Wastewater Treatment Demonstration Project in the Florida Keys, Monroe County, Florida. The purpose of the project is to evaluate available nutrient reducing onsite and clustered wastewater technologies and to demonstrate the management of decentralized wastewater treatment systems (DWTS) under a utility management structure. Decentralized wastewater systems are defined as onsite and clustered wastewater treatment systems that treat wastewater at or near the site it was generated. The project would include upgrading approximately 100 existing onsite wastewater treatment systems (OWTS) in one or more study areas in the Florida Keys for management by Monroe County and a contracted operations/utility management firm. The total project cost is \$5.07 million, which includes a requested amount from federal assistance of \$3.8 million dollars (~75%) and a local match amount of \$1.3 million dollars (~25%).

In addition to the SF-424, Monroe County is providing this narrative statement and work plan for U.S. Environmental Protection Agency (EPA) review and comment. The narrative statement provides background information, a project description, and goals and objectives, while the work plan describes the tasks that will be accomplished and demonstrated in the national demonstration project. The document further establishes a preliminary timeline and budget for implementation and completion.

1.1 Background

The Florida Keys: The Florida Keys, located in Monroe County off of the southeastern tip of Florida, are a chain of approximately 800 independent islands, representing the most southerly point of the continental United States. The more developed islands are connected by U.S. Highway 1, a 110 mile stretch of roadway and 42 bridges extending from Key Largo to Key West. All the waters adjacent to the islands have been designated as Outstanding Florida Waters (OFW), and include the 2,800-nautical-square-mile Florida Keys National Marine Sanctuary (FKNMS), the second largest



national marine sanctuary in the United States. These waters are home to a complex and dynamic ecosystem, including the world's third largest coral reef system.

Keys Geology: The Florida Keys are a limestone island archipelago extending southwest over 200 miles from the southern tip of the Florida mainland to the Dry Tortugas. The developed areas of the Keys are divided into three regions: 1) the Upper Keys, from the mainland to Upper Matecumbe Key; 2) the Middle Keys, from Upper Matecumbe Key to the Seven Mile Bridge; and 3) the Lower Keys from Little Duck Key to Key West.

The Florida Keys are low-lying, with an average elevation of 3 to 6 feet above sea level. The Middle Keys are generally smaller than the Upper and Lower Keys with numerous wide channels separating each island.

The surface of the Upper and Middle Keys is composed of Key Largo Limestone. The Key Largo Limestone is a coralline limestone composed of coral heads encased in a matrix of calcarenite. The thickness of the formation ranges from 75 to 170 feet and exhibits high porosity and permeability. It occurs below the surface as far north as Miami Beach to as far south as Bahai Honda. Near the northern and southern limits of the Key Largo Limestone, it is overlain conformably by the Miami Limestone (Florida Geological Survey, 1992).

The Lower Keys (with the exception of Little Duck Key, the Newfound Harbor Keys, and a portion of Big Pine Key) are composed of oolitic Miami Limestone. The Miami Limestone is made up of two facies, the oolitic and bryozoan. The bryozoan facies underlies and extends west of the western boundary of the oolitic facies. The bryozoan facies consists of calcareous bryozoan colonies imbedded in a matrix of ooids, pellets, and skeletal sands. The oolitic facies consists of variably sandy limestone composed primarily of oolites with scattered concentrations of fossils. The oolite formation is thin over the southern border of the Lower Keys, reaching a maximum thickness of 40 feet on the northern part of Stock Island. The channels between the Lower Keys are the remnants of the original tidal channels that developed in the sand shoals. The Miami Limestone exhibits high porosity but lower permeability than Key Largo Limestone (NOAA, 1996).

Because of the low topographic relief and pervious nature of the Key Largo and Miami Limestone formations, most rainfall in the Keys infiltrates the surface and forms shallow freshwater lenses. Groundwater in the Keys is restricted to these shallow lenses and deeper waters of the Floridan Aquifer. The freshwater lense generally becomes thicker during the rainy season and thinner or absent during the dry season (NOAA, 1996). Only the largest Keys, such as Big Pine Key, maintain a permanent fresh water lens.

The Floridan aquifer underlies the Miami Limestone. The sediment that comprises the Floridan aquifer system underlies all of Florida, although potable water is not present everywhere. The aquifer's surface in South Florida is generally 500 to 1000 feet deep and its average thickness is about 3000 feet. It is divided into three hydrogeological units; 1) the upper Floridan; 2) the

middle confining unit; and 3) the lower Floridan aquifer. In south Florida and the Keys, the upper Floridan aquifer contains brackish groundwater, while the lower Floridan aquifer contains salt water.

Soils in the Keys are very thin over shallow bedrock. The physical characteristics of all soil types present in Monroe County are rated by USDA to have severe or very severe limitations for conventional OWTS. Generally, there is insufficient soil depth to provide purification of septic tank effluent before it reaches the groundwater. Due to the porous nature of the rock combined with tidal influences, the use of conventional OWTS in the Keys may therefore result in inadequately treated sewage leaching into the waterways of the Keys (Monroe County, 1992).

Keys Climate: The Keys have a tropical maritime climate. There are essentially two seasons: 1) Summer which last from May to October; and 2) Winter which lasts from November to April. The summer season is characterized as wet with numerous thunderstorms. The winter months are typically dry with infrequent, fast moving cold fronts. Primarily the warm waters of the Gulf and Atlantic, the Florida Current, and the Gulf Stream influence the climate.

The Keys have very moderate temperatures with an annual average high temperature of 82.4°F and an average annual low temperature of 75.4°F. The prevailing easterly winds which pass over the Gulf Stream transport warm air over the Keys. Cold fronts, which approach from the north are warmed by the Gulf and Florida Bay waters. The Keys have very little land mass in which to modify the air temperature. The air temperature reflects the surface conditions of the water, which maintains the warmer temperatures. Average temperature variation is about 2°F from the Upper to the Lower Keys. The highest daily average temperature of 89.6°F occurs in July and August and the lowest daily average temperature of 66.2°F typically occurs in February. Temperature below freezing has never been recorded in the Keys.

The Keys are one of the driest areas in Florida with an average of 49 inches of precipitation per year. The highest monthly mean rainfall occurs in September (6.5 inches) and the lowest monthly mean rainfall of 1.3 inches occurs in March (NOAA, 1996). The lack of precipitation can be attributed to minimal well-established land/sea breezes and the limited number of large-scale synoptic systems in the area. The majority of the rainfall occurs during summer in the form of locally intense convective storms. A small percentage (18 to 33 percent) of the areas precipitation occurs during the winter. Precipitation peaks in June and the latter part of September. Drought conditions are not common; however, they can occur at any time when stable, stationary air masses inhibit convection.

1.2 Problem Description

Water Quality: The Florida Keys marine ecosystem is dependent on clear water with low levels of nutrients, specifically nitrogen and phosphorus. However, like most natural resources today, rapid development, population growth, and increases in tourism have threatened the health and future existence of the Keys environment. The deterioration of the reef and the entire marine

ecosystem has been the subject of many studies. Scientists concur that one of the principle causes of the Keys unhealthy state is the elevated level of nutrients in the surrounding canals and nearshore waters.

Wastewater Treatment: As population and tourism in the Keys have increased over the years, improvements in wastewater treatment and management practices have not kept pace with this growth. As a result, anthropogenic sources of nutrients to confined canal and nearshore coastal waters have increased, resulting in a decline in water quality. Nitrogen and phosphorus are found in high levels in raw sewage and secondary treated wastewater discharges. Research has determined that nitrogen and phosphorus from wastewater are one of the major sources of nutrients to nearshore waters, and scientists generally agree that improved wastewater treatment practices would improve canal and nearshore water quality (U.S. EPA, 1999).

Wastewater treatment technologies of today are capable of significantly reducing nutrient levels in wastewater, but the high cost of their implementation on a scale as large as the Keys makes the solution extremely challenging for Monroe County. As a result, improving wastewater practices in the Keys has received a major focus of attention in recent years. Over the last decade, aggressive steps have been taken by federal, state, and local authorities to help restore and maintain the Keys natural ecosystem. Requirements of the Monroe County Year 2010 Comprehensive Plan resulted in the recent development of the Monroe County Sanitary Wastewater Master Plan (CH2M HILL, 2000). This plan outlines recommendations for five regional wastewater collection and treatment systems, twelve community systems, and advanced decentralized wastewater treatment systems (DWTS) for the remainder of the Keys planning area. DWTS are defined as onsite and clustered wastewater treatment systems that treat wastewater at or near the site it was generated.

Since onsite systems will continue to be utilized for wastewater treatment in the least developed parts of the Keys, Monroe County is proposing to develop a management structure for DWTS that will allow them to be managed under a wastewater utility concept. Utility management of DWTS is a relatively new concept in the U.S., and funding for this demonstration project will assist Monroe County in establishing a DWTS management structure, identifying and testing appropriate onsite wastewater nutrient reduction systems (OWNRS) technologies, and identifying methods and technologies for remote monitoring and management of the OWNRS in the study area.

2.0 WASTEWATER MANAGEMENT IN THE KEYS

2.1 Existing Wastewater Systems

Approximately 23,000 private onsite wastewater treatment systems (OWTS) and 246 small wastewater treatment plants (WWTPs) currently operate throughout the Keys (CH2M HILL, 2000). Each of these onsite systems and treatment plants provide minimal nutrient removal, and generally discharge effluent containing total nitrogen (TN) and total phosphorus (TP) concentrations of approximately 20 mg/L and 6 mg/L, respectively. The onsite systems primarily serve single family residences and small commercial establishments, while the small WWTPs serve condominium and apartment complexes, resorts, motels, restaurants, and other larger commercial establishments where higher volumes of wastewater are generated. Property owners are responsible for managing, operating, and maintaining their individual systems, whether they are onsite systems or small WWTPs.

OWTS are the predominant method of existing wastewater treatment in the Keys, comprised of approximately 15,200 permitted conventional septic systems, 640 aerobic treatment units (ATUs), and 7,200 systems of unknown type (Figure 2-1). Many of the unknown systems are suspected to be cesspools.

Cesspools: Cesspools, or seepage pits, were some of the earliest forms of onsite wastewater systems in the Keys. They consist of a large excavation in the ground lined with brick, stone or block that allowed raw wastewater to seep into the natural rock or groundwater (Figure 2-2). Without a significant soil layer, very little treatment of the wastewater occurs in the cesspool, especially if it intercepts groundwater. Pollutant removal is then limited to what the natural rock provides. It has been estimated that as many as 2,800 of these early cesspools are still in existence in the Florida Keys.

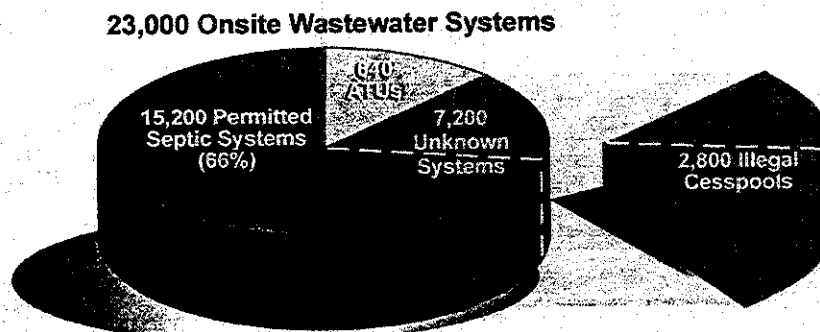


Figure 2-1. Thirty percent, or 7,200 of the 23,000 onsite wastewater systems in the Keys are not permitted, and may include up to 2,800 illegal cesspools.

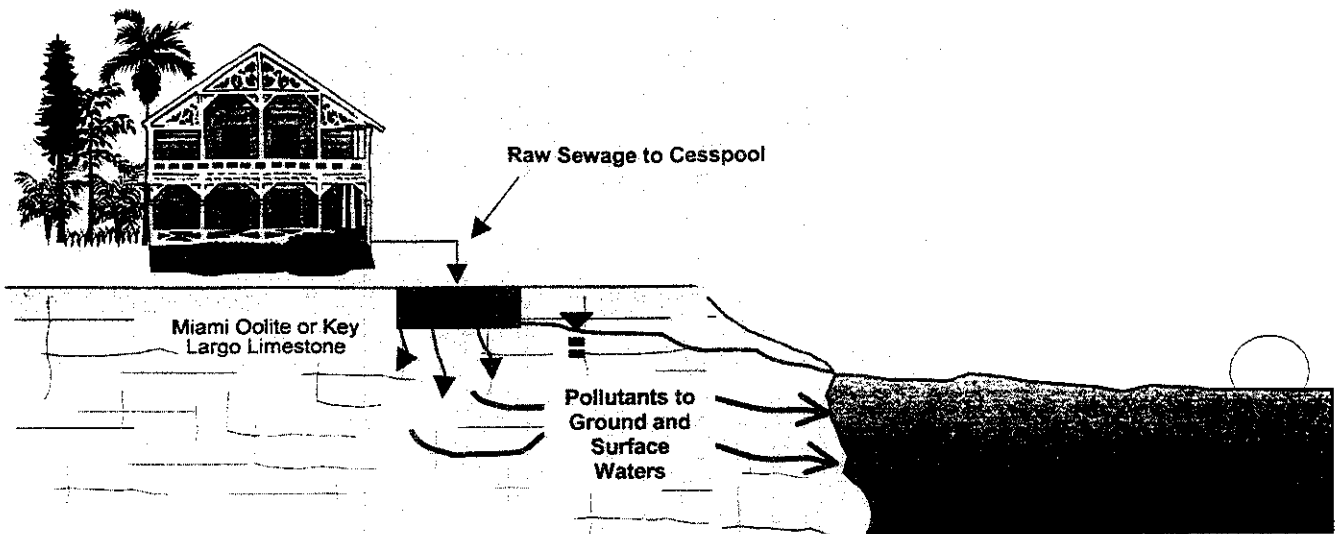


Figure 2-2. Many of the unknown systems in the Keys are cesspools, or seepage pits, and provide little, if any, wastewater treatment.

Conventional OWTS: Modern, conventional OWTS are more sophisticated wastewater treatment systems that rely on land treatment provided by soils for ultimate wastewater renovation and disposal. If constructed properly and operated and maintained over their lifetime, modern land treatment systems, including OWTS, can provide wastewater treatment performance that equals conventional centralized wastewater treatment plants.

Conventional OWTS consist of a septic tank and subsurface wastewater infiltration system (SWIS), or drainfield, and rely on naturally occurring soils to provide most of the wastewater treatment (Figure 2-3). The problem for conventional OWTS in the Keys is that very little or no natural soil exists over the ancient coral/limestone rock. Therefore, soil must be imported to construct conventional OWTS drainfields in the Florida Keys. The limited underlying soils in the Keys reduce the treatment effectiveness of these systems, especially for nutrients.